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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,100	09/25/2003	Martin Howlid	2088.003700/14.0212	6349

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EXAMINER	
HUGHES, SCOTT A	

ART UNIT	PAPER NUMBER
3663	

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/671,100	HOWLID ET AL.	
	Examiner	Art Unit	
	Scott A Hughes	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-33 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-33 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 26 January 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5-6, 14-15, 20-21, 23-24 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Kragh.

With regard to claim 1, Kragh discloses a method of processing seismic data acquired using a seismic source array that emits, in use, a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency, the method comprising processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data (Page 3, Line 12 to Page 4, Line 9; Page 6).

With regard to claim 2, Kragh discloses that the seismic source array emits, in use, a seismic wavefield having a frequency spectrum that does not contain a source ghost at non-zero frequency in the frequency range up to 500Hz, for a take-off angle of up to 45 degrees (Page 19, 2nd full paragraph) (Page 3, Line 12 to Page 4, Line 9; Page 6; Page 11, Line 20 to Page 12, Line 6). Kragh discloses that it is known that the first non-zero ghost notch frequency is related to the angle of incidence from the source (take-off angle). Kragh gives an example of a frequency of 160 Hz. From the description, Kragh discloses that it is known that the frequency of the first ghost is

related to the depth that the receiver is at, the incidence angle, and the velocity of the signal in the water.

With regard to claim 3, Kragh discloses processing the seismic data to attenuate the effects of receiver-side ghost reflections (Page 3, last paragraph).

With regard to claim 5, Kragh discloses a method of acquiring seismic data. Kragh discloses actuating a seismic source array to emit seismic energy having a frequency spectrum that does not contain a source ghost notch at a non-zero frequency within the seismic bandwidth (Page 3, Line 12 to Page 4, Line 9; Page 6). Kragh discloses acquiring seismic data at a seismic receiver and processing the acquired seismic data according to a method defined in claim 1 thereby to attenuate the effect of the ghost reflections (Page 3, Line 12 to Page 4, Line 9).

With regard to claim 6, Kragh discloses a method of acquiring seismic data. Kragh discloses actuating a seismic source array to emit seismic energy having a frequency spectrum that does not contain a ghost notch at a non-zero frequency within the bandwidth. Kragh discloses acquiring seismic data at a seismic receiver and processing the acquired seismic data to attenuate the effect of ghost reflections (Page 3, Line 12 to Page 4, Line 9; Page 6).

With regard to claim 14, Kragh discloses that the sources are disposed substantially at the surface of a water column (Page 11) (Fig. 1).

With regard to claim 15, Kragh discloses that the sources are disposed substantially at the surface of a water column (Page 11) (Fig. 1).

With regard to claim 20, Kragh discloses an apparatus for processing seismic data acquired using a seismic source array that emits, in use, a seismic wavefield having a frequency spectrum that does not contain a notch at a non-zero frequency, the apparatus comprising a means for processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data (Page 3, Line 12 to Page 4, Line 9; Page 6).

With regard to claim 21, Kragh discloses processing seismic data to attenuate the effects of receiver-side ghost reflections (Page 3, Line 12 to Page 4, Line 9; Page 6).

With regard to claim 23, Kragh discloses a programmable data processor. Kragh discloses methods throughout the specification, and it is obvious that a computer is used to carry out the processing and to produce the data seen in Figs. 3-7.

With regard to claim 24, Kragh discloses a seismic surveying arrangement. Kragh discloses a seismic source array that emits, in use, a seismic wavefield having a frequency spectrum that does not contain a notch at a non-zero frequency. Kragh discloses one or more seismic receivers 18 (Fig. 1) for acquiring seismic data and an apparatus as defined in claim 20 for processing seismic data acquired by the receivers (Page 3, Line 12 to Page 4, Line 9; Page 6).

With regard to claim 29, Kragh discloses that the sources are disposed substantially at the surface of a water column (Page 11, Fig. 1).

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 5-21, and 23-33 are rejected under 35 U.S.C. 102(e) as being anticipated by DeKok.

With regard to claim 1, DeKok discloses a method of processing seismic data acquired using a seismic source array that emits, in use, a seismic wavefield having a frequency spectrum within the seismic bandwidth that does not contain a source ghost at a non-zero frequency, the method comprising processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data (Column 1, Line 42 to Column 2, Line 27).

With regard to claim 2, DeKok discloses that the seismic source array emits, in use, a seismic wavefield having a frequency spectrum that does not contain a source ghost at non-zero frequency in the frequency range up to 500Hz, for a take-off angle of up to 45 degrees (Column 1, Line 42 to Column 2, Line 27; (Figs. 4a-c)).

With regard to claim 3, DeKok discloses processing the seismic data to attenuate the effects of receiver-side ghost reflections (Column 3, Lines 41-45; Column 5, Lines 1-10).

With regard to claim 5, DeKok discloses a method of acquiring seismic data. DeKok discloses actuating a seismic source array to emit seismic energy having a frequency spectrum that does not contain a source ghost notch at a non-zero frequency within the seismic bandwidth (Column 1, Line 42 to Column 2, Line 27). DeKok discloses acquiring seismic data at a seismic receiver and processing the acquired seismic data according to a method defined in claim 1 thereby to attenuate the effect of the ghost reflections (Column 1, Line 42 to Column 2, Line 27; Column 5; Column 7, outlined in the entire disclosure).

With regard to claim 6, DeKok discloses a method of acquiring seismic data. DeKok discloses actuating a seismic source array to emit seismic energy having a frequency spectrum that does not contain a ghost notch at a non-zero frequency within the bandwidth. DeKok discloses acquiring seismic data at a seismic receiver and processing the acquired seismic data to attenuate the effect of ghost reflections Column 1, Line 42 to Column 2, Line 27; Column 5; Column 7, method is outlined in the entire disclosure).

With regard to claims 7, DeKok discloses that the source array comprises a first seismic source and a second seismic source disposed, in use, below the first seismic source ((Column 7, Lines 45-55).

With regard to claims 8, DeKok discloses that the source array comprises a first seismic source and a second seismic source disposed, in use, below the first seismic source (Column 7, Lines 45-55).

With regard to claim 9, DeKok discloses that the second seismic source is vertically below the first seismic source (Column 7, Lines 45-55).

With regard to claim 10, DeKok discloses that the second seismic source is vertically below the first seismic source (Column 7, Lines 45-55).

With regard to claim 11, DeKok discloses actuating a second source at a predetermined time after actuating the first seismic source (Column 7, Lines 45-55).

With regard to claim 12, DeKok discloses actuating a second source at a predetermined time after actuating the first seismic source (Column 7, Lines 45-55).

With regard to claim 13, DeKok discloses that the predetermined time is substantially equal to the travel time of seismic energy from the first source to the second source (Column 7, Lines 45-65).

With regard to claim 14, DeKok discloses that the sources are disposed substantially at the surface of a water column (Fig. 2a).

With regard to claim 15, DeKok discloses that the sources are disposed substantially at the surface of a water column (Fig. 2a).

With regard to claim 16, DeKok discloses that the source array comprises means for absorbing upwardly emitted seismic energy (Column 7, Line 45 to Column 8, Line 9).

With regard to claim 17, DeKok discloses that the source array comprises means for absorbing upwardly emitted seismic energy (Column 7, Line 45 to Column 8, Line 9).

With regard to claim 18, DeKok discloses that the source array comprises means for inducing positive reflection of upwardly-emitted seismic energy (Column 7, Line 45 to Column 8, Line 9).

With regard to claim 19, DeKok discloses that the source array comprises means for inducing positive reflection of upwardly-emitted seismic energy (Column 7, Line 45 to Column 8, Line 9).

With regard to claim 20, DeKok discloses an apparatus for processing seismic data acquired using a seismic source array that emits, in use, a seismic wavefield having a frequency spectrum that does not contain a notch at a non-zero frequency, the apparatus comprising a means for processing the acquired seismic data thereby to attenuate the effect of ghost reflections in the seismic data (Column 1, Line 42 to Column 2, Line 27; Column 5; Column 7, outlined in the entire disclosure).

With regard to claim 21, DeKok discloses processing seismic data to attenuate the effects of receiver-side ghost reflections (Column 3, Lines 41-45; Column 5, Lines 1-10).

With regard to claim 23, DeKok discloses a programmable data processor (Column 4, Line 60 to Column 5, Line 32; Column 12 to Column 16). DeKok discloses a process for de-ghosting data, and therefore there is necessarily a processor to perform the operations described therein.

With regard to claim 24, DeKok discloses a seismic surveying arrangement. DeKok discloses a seismic source array that emits, in use, a seismic wavefield having a frequency spectrum that does not contain a notch at a non-zero frequency (Column 1, Line 42 to Column 2, Line 27; Column 5; Column 7, outlined in the entire disclosure). DeKok discloses one or more seismic receivers 27 (Fig. 2a) for acquiring seismic data and an apparatus as defined in claim 20 for processing seismic data acquired by the

receivers (Figs. 1-9, entire disclosure). DeKok discloses the process and shows the apparatus necessary in the Figures.

With regard to claim 25, DeKok discloses that the source array comprises a first source and a second source disposed below the first source (Column 7, Lines 45-55).

With regard to claim 26, DeKok discloses that the second source is vertically below the first source (Column 7, Lines 45-55).

With regard to claim 27, DeKok discloses a means for actuating the second source at a predetermined time after the first source (Column 7, Lines 45-65).

With regard to claim 28, DeKok discloses that the predetermined period of time is equal to the travel time of the seismic energy from the first source to the second source (Column 7, Lines 45-65).

With regard to claim 29, DeKok discloses that the sources are disposed substantially at the surface of a water column (Fig. 2a).

With regard to claim 30, DeKok discloses that the source array comprises means for absorbing upwardly emitted seismic energy (Column 7, Line 45 to Column 8, Line 9).

With regard to claim 31, DeKok discloses that the source array comprises means for inducing positive reflection of upwardly-emitted seismic energy (Column 7, Line 45 to Column 8, Line 9).

With regard to claim 32, DeKok discloses a storage medium comprising a program for a data processor of an apparatus as defined in claim 23 (Column 3, Lines 40-45, Column 12). From the disclosure and the drawings, it is apparent that there is a storage medium (in the form of a computer) for carrying out the process.

With regard to claim 33, DeKok discloses a storage medium containing a program for controlling the data processor to perform the method of claim 1 (Column 3, Lines 40-45, Column 12). DeKok discloses the method of claim and describes the process for carrying out the method throughout the disclosure. From the disclosure and the drawings, it is apparent that there is a storage medium (in the form of a computer) for carrying out the process.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeKok or Kragh as applied to claims 1 and 20 above and further in view of Soubras.

DeKok does not disclose a method of de-ghosting involving separating the data into up-going and down-going constituents. Soubras discloses a method of de-ghosting that uses the same ghost notch identification as DeKok and Kragh (Column 1) and further involving separating the data into up-going and down-going constituents (Columns 3-11). It would have been obvious to modify DeKok or Kragh to include separating the data into up-going and down-going waves as disclosed by Soubras in order to have a way to remove peg-leg multiple reflections (Column 5).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Robertson, who discloses a method of de-ghosting seismic data by separating up and down-going acoustic waves.

Duren, who discloses a controlled phase marine source sub array that produces sources outside of the range where the first ghost notch is found and also at angles limited by the geometry of the array and the ghost notch frequencies (i.e. incidence angle as claimed in claim 2).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A Hughes whose telephone number is 571-272-6983. The examiner can normally be reached on 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Tarcza can be reached on (571) 272-6979. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAH

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